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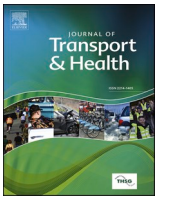

Transportation and other social needs as markers of mental health conditions

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ABSTRACT

Objective: The study sought to determine whether reporting a history of depression, anxiety, PTSD, bipolar disorder, drug or alcohol use disorder, ADHD, schizophrenia, or current depressive symptoms was associated with requesting help for any of 12 social needs.
Methods: A community-based sample of 1,944 low-income adult smokers in Missouri who had called a telephone helpline for social needs were recruited between June 1, 2017 and November 15, 2020. Helpline data on callers' requests for assistance with utilities, housing, food, household goods, healthcare, transportation, adult care, financial assistance, employment, legal assistance, personal safety and childcare were merged with self-reported mental health data collected in a subsequent phone survey with the same callers. Using binary logistic regression, we examined which mental health conditions were associated with each social need.
Results: Reporting mental health conditions were associated with greater odds of requests for assistance with transportation, food, healthcare and personal safety. Of these, the strongest and most consistent associations were with transportation needs. In post-hoc analyses, most associations between transportation needs and mental health remained significant after adjusting for possible confounders.
Conclusions: Compared to participants who did not report histories of mental health conditions, those who reported mental health conditions were more likely to call 2-1-1 seeking transportation assistance. Community-based agencies providing transportation or mental health services could partner to provide linkages between services and increase capacity to address transportation and mental health needs.

1. Introduction

Low-income Americans experience a wide range of unmet social needs. Chief among these are housing, food and utility payment assistance, but others include transportation, childcare and employment (Kreuter et al., 2020).

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Having unmet social needs is associated with many adverse health outcomes (National Academies of Sciences and Medicine, 2019), including mental health disorders (Allen et al., 2014). Studies in diverse populations and settings have consistently found that individuals with more unmet social needs have increased likelihood of experiencing stress (Bisgaier and Rhodes, 2011), depression (Blazer et al., 2007), anxiety (Campion et al., 2013), or other mental health conditions (Fryers et al., 2005; Jenkins et al., 2008; Kreuter et al., 2021). Because of strong links between social needs, health and mental health, many health care organizations now routinely screen for social needs and assist in addressing them (Artiga and Hinton, 2018).

Conceptual and theoretical models linking social needs and health also prominently feature mental health. Many models depict how unmet social needs can impact mental health (Bernardini et al., 2021; Muennig et al., 2020; Owusu-Addo et al., 2019). For example, needing help to pay one's rent or mortgage could increase anxiety (Burgard et al., 2012). Other models add that mental health could mediate the association between social needs and physical health (Hoke and Boen, 2021) or increase the odds of having unmet social needs (Ohrnberger et al., 2017). For example, needing food to feed one's family could induce stress, which is heightened by having to decide between buying food or addressing other needs, such as prescription medicine for a health condition (Knowles et al., 2016).

Mental health conditions are associated with greater burden of homelessness (Folsom et al., 2005), food insecurity (Maynard et al., 2018), unemployment (Butterworth et al., 2012), and financial strain (Luciano et al., 2014). Those living with serious mental illness describe frequently running out of money before the end of each month, which causes difficulties meeting basic needs, such as buying clothing, and limited ability to engage in social opportunities, such as meeting friends for coffee (Wilton, 2003). Unmet social needs significantly impact the daily lives of those living with mental conditions.

Still unanswered by prior research and unaddressed in the aforementioned models is whether certain health outcomes, including mental health conditions, are more strongly associated with certain social needs. We interviewed a community-based sample of low-income adults immediately after they called a safety net helpline requesting assistance with one of 12 social needs. Participants self-reported past diagnoses of mental health conditions and responded to screening items for current depressive symptoms. We examined whether certain mental health conditions were stronger correlates of certain social needs than other conditions. Although the cross-sectional nature of this analysis limits the ability to draw conclusions about causality, understanding these associations with greater precision can help mental health, social service and healthcare providers plan, coordinate and deliver more effective support for mental health and social needs, and refine explanatory models guiding intervention and policy development.

2. Methods

2.1. Research setting

This study uses baseline data collected pre-intervention from a randomized controlled trial testing two interventions to help low-income smokers quit (Garg et al., 2021). Between June 1, 2017 and November 15, 2020, a random sample of callers to the Missouri 2-1-1 helpline were screened for study eligibility after receiving standard service from 2-1-1. The 2-1-1 helpline is a free, information and referral number that serves all 50 states and receives around 12 million requests per year from callers requesting assistance with needs ranging from finding food pantries to utility bill payment assistance (United Way Worldwide, 2019). Operators record callers' requests in a database and provide referrals to local services agencies that may be able to address their needs.

Callers to 2-1-1 who were interested in the study and agreed to share their contact information were called by phone by a study team member starting the next business day to enroll and complete a telephone survey. All participants provided verbal informed consent. Research procedures and materials for the study were approved by the Human Research Protection Office at Washington University.

2.2. Participants

All participants were adult daily smokers living in Missouri who were planning to quit smoking in the next 30 days (n=1,944). Detailed enrollment procedures and other eligibility criteria (e.g., not pregnant, not in crisis) are reported elsewhere (McQueen et al., 2019).

2.3. Measures

The study integrated service request data from each participant's call to 2-1-1 with their responses to the telephone survey administered a few days later. The telephone survey screened for a history of seven mental health conditions and current depressive symptoms.

2.3.1. Social needs

Participants' social needs were identified using service request data documented during their call to 2-1-1. Operators track each need reported by callers as a separate service request, classifying needs using a taxonomy (211 LA County, 2021) of unique codes for over 10,000 possible needs. Callers can make multiple requests; our sample included 3,315 total requests – averaging 1.7 requests per participant – using 317 unique codes in the taxonomy. We grouped these into 12 social need categories: utilities, housing, food, household goods (e.g., furniture vouchers), healthcare, transportation, adult care (e.g. centers for independent living), financial assistance, employment, legal assistance, personal safety, and childcare.

Nearly all 3,315 requests to 2-1-1 (94%, n=3,106) could be classified into one of 12 categories. Among the remainder, 4.6% (154 requests) were classified in an "other" category that included consumer complaints and where to make a donation, and 1.7% (55 requests) were classified into one of two behavioral health categories: mental health care (e.g. counseling services) or substance use treatment (e.g., addiction support groups). We created a dichotomous variable for each category, where participants received a "1" if they had one or more service requests in that category or a "0" if they did not.

2.3.2. Mental health

Seven single items on the telephone survey assessed whether participants had ever been told by a doctor they had depression, generalized anxiety disorder, post-traumatic stress disorder (PTSD), bipolar disorder, drug or alcohol use disorder, attention-deficit/hyperactivity disorder (ADHD), or schizophrenia (yes=1; no=0 for each item). Current depressive symptoms were assessed using the two-item Patient Health Questionnaire (PHQ-2) depression screener. Responses to the PHQ-2 screener were summed to create a score ranging from 0 to 6, and dichotomized using the recommended cut point (≥3) to indicate need for further screening to identify potential major depression (Kroenke et al., 2003). We included the PHQ-2 as a complement a to the measure of depression history, allowing us to identify potential differences in their associations with social needs.

2.3.3. Demographics

The telephone survey assessed participants' age, sex, race, ethnicity, income, education, employment status, and ZIP code, which was used to classify participants as living in rural or non-rural areas (Federal Office of Rural Health Policy, 2020).

Table 1
Demographic characteristics, social and mental health needs, and mental health of 2-1-1 callers (n=1,944).

Sample characteristics	Frequency (%)
Demographics	
Age (years), mean (SD)	48.4 (12.2)
Female	1396 (71.8)
Race	
Black or African-American	1111 (57.8)
White	666 (34.7)
Other	144 (7.5)
Hispanic	55 (2.9)
Annual pre-tax household income	
< $10,000	957 (51.2)
$10,000 - $19,999	572 (30.6)
≥ $20,000	340 (18.2)
Education	
< High school	588 (30.4)
High school/GED	580 (29.9)
> High school	769 (39.7)
Work outside the home	507 (26.1)
Live in rural ZIP code	151 (7.8)
Social needs	
Utilities	907 (46.7)
Housing	592 (30.5)
Food	271 (13.9)
Household goods	196 (10.1)
Healthcare	123 (6.3)
Transportation	70 (3.6)
Adult care	66 (3.4)
Financial assistance	57 (2.9)
Employment	36 (1.9)
Legal assistance	27 (1.4)
Personal safety	12 (0.6)
Childcare	7 (0.4)
Behavioral health requests	
Mental health care	19 (1.0)
Substance use treatment	14 (0.7)
Mental health survey items	
Depression	1186 (61.4)
Generalized anxiety disorder	721 (37.6)
Post-traumatic stress disorder	571 (29.8)
Bipolar disorder	565 (29.3)
Drug or alcohol use disorder	375 (19.4)
Attention-deficit/hyperactivity disorder	254 (13.2)
Schizophrenia	196 (10.2)
At least one condition	1380 (71.0)
Two or more conditions	1022 (52.6)
Current depressive symptoms (PHQ-2 ≥3)	922 (48.4)

Table 2
Unadjusted odds ratios and 95% confidence intervals from bivariate logistic regression models predicting social needs of 2-1-1 callers.

Social needs	*Depression*	*Generalized anxiety disorder*	*Post-traumatic stress disorder*	*Bipolar disorder*	*Drug or alcohol use disorder*	*Attention-deficit/ hyperactivity disorder*	*Schizophrenia*	*Current depressive symptoms*
Utilities	0.93 (0.89–1.43)	0.83 (0.69–1.00)	**0.68 (0.56–0.83)**	**0.66 (0.54–0.80)**	**0.77 (0.61–0.96)**	**0.70 (0.53–0.91)**	0.75 (0.55–1.01)	0.92 (0.77–1.10)
Housing	0.95 (0.78–1.16)	0.95 (0.78–1.17)	1.14 (0.93–1.41)	1.03 (0.82–1.27)	**1.31 (1.03–1.65)**	1.23 (0.93–1.63)	1.04 (0.76–1.43)	1.12 (0.92–1.36)
Food	**1.35 (1.03–1.78)**	**1.37 (1.05–1.77)**	**1.62 (1.25–2.13)**	1.29 (0.99–1.70)	1.10 (0.80–1.51)	**1.74 (1.24–2.44)**	1.39 (0.94–2.05)	1.17 (0.90–1.52)
Household goods	1.19 (0.88–1.63)	1.20 (0.88–1.62)	1.31 (0.96–1.80)	1.20 (0.88–1.65)	0.90 (0.61–1.32)	1.17 (0.77–1.77)	1.15 (0.72–1.89)	0.91 (0.68–1.23)
Healthcare	1.37 (0.92–2.02)	**1.49 (1.03–2.16)**	1.21 (0.82–1.79)	1.43 (0.97–2.10)	1.08 (0.68–1.70)	0.63 (0.34–1.20)	0.87 (0.46–1.64)	1.35 (0.93–1.95)
Transportation	**2.59 (1.43–4.70)**	**2.43 (1.50–3.94)**	**2.76 (1.71–4.46)**	**2.74 (1.69–4.45)**	**2.40 (1.45–3.97)**	**2.56 (1.49–4.42)**	1.55 (0.78–3.09)	1.60 (0.98–2.63)
Adult care	**1.58 (0.92–2.72)**	1.01 (0.61–1.68)	0.64 (0.35–1.16)	0.72 (0.40–1.29)	0.74 (0.37–1.460)	**0.30 (0.09–0.98)**	0.72 (0.28–1.81)	1.60 (0.95–2.68)
Financial assistance	0.60 (0.35–1.01)	0.83 (0.47–1.44)	0.50 (0.25–1.01)	0.86 (0.47–1.56)	0.69 (0.32–1.46)	**0.24 (0.06–0.98)**	0.69 (0.25–1.92)	0.63 (0.36–1.09)
Employment	0.59 (0.30–1.15)	0.55 (0.25–1.17)	0.48 (0.20–1.17)	0.74 (0.33–1.64)	0.40 (0.12–1.31)	1.10 (0.42–2.85)	0.83 (0.25–2.72)	0.74 (0.37–1.48)
Legal assistance	1.50 (0.66–3.45)	0.83 (0.37–1.85)	0.74 (0.30–1.87)	1.52 (0.68–3.36)	0.54 (0.16–1.80)	1.14 (0.39–3.34)	0.34 (0.05–2.49)	0.98 (0.45–2.16)
Personal safety	1.90 (0.51–7.03)	1.39 (0.42–4.56)	**3.33 (1.05–10.55)**	0.80 (0.22–2.98)	0.83 (0.18–3.81)	**4.76 (1.50–15.13)**	1.49 (0.47–4.72)	1.49 (0.47–4.72)
Childcare	0.47 (0.11–2.11)	0.66 (0.13–2.43)	0.94 (0.18–4.88)	0.40 (0.05–3.34)	[a]	1.09 (0.13–3.13)	[a]	0.21 (0.02–1.82)

Boldface indicates significance at the $p < .05$ level.

[a] No participants requesting assistance for childcare needs reported a mental health condition in the intersecting column. The childcare need variable and participants who reported it were therefore omitted from the model due to absence of variability on the outcome.

2.4. Analyses

We estimated bivariate logistic regression models to test associations between each mental health condition and each social need. We report odds ratios and 95% confidence intervals for each association. Listwise deletion was used to exclude participants from models if they were missing data on the independent or dependent variables. Rates of missingness were low, and listwise deletion resulted in removal of 2–3% of cases. Risk of bias or loss of power are likely to be inconsequential when missing cases are less than 5% (Graham, 2009). Control variables were added in post-hoc multivariable logistic regression analyses. Data were managed using R, version 3.6.1, and analyzed using Stata, version 16.

3. Results

3.1. Participants

Participants' mean age was 48.4 years (SD = 12.2). Most participants were women (72%) and African American (58%). Half (51%) reported annual pre-tax household income less than $10,000 and 30% had not completed high school. Most participants lived in non-rural areas (92%) (Table 1).

3.2. Social needs and mental health

The most common requests to 2-1-1 were for assistance with utility payments (47% of participants), housing (31%), or food (14%).

Seventy one percent of participants reported a history of at least one mental health condition, and 53% reported multiple mental health conditions. The most common mental health conditions identified in the survey were depression (61% of participants), anxiety (38%), PTSD (30%) and bipolar disorder (29%). Nearly half of participants (48%) had current depressive symptoms at or above the threshold for screening for major depression (Table 1).

3.3. Associations between social needs and mental health conditions

Bivariate logistic regression analyses compared the odds of requesting help from 2-1-1 for each social need among those who did and did not report a history of each mental health condition (or current depressive symptoms) (Table 2). In separate models, those reporting histories of depression, anxiety, PTSD, bipolar disorder, drug or alcohol use disorder, or ADHD all had over two times the odds of requesting transportation assistance (e.g., community ride programs, mass transit vouchers, automotive repair/maintenance) from 2-1-1 compared to those who reported no histories of these conditions (Table 2).

Participants who reported a history of depression, anxiety, PTSD, or ADHD had greater odds of requesting food assistance (e.g., food pantries, home delivered meals, SNAP applications) than those who did not report those conditions. Those reporting anxiety had greater odds of requesting healthcare assistance (e.g., prescription expense assistance, dental care, community clinics), while those reporting a history of PTSD or ADHD had greater odds of requesting help for personal safety needs (e.g., domestic violence support, crime victim support, adult protective services) than participants who did not report those conditions (Table 2).

Reporting a history of anxiety, PTSD, bipolar disorder, or ADHD was associated with lower odds of requesting utility assistance (e.g., utility bill payment or deposit assistance, service connection/repair) compared to those who reported no history of these conditions. Reporting a history of ADHD was also associated with lower odds of requesting financial assistance or help with adult care from 2-1-1 compared to those with no history of ADHD. Reporting a history of schizophrenia or reporting current depressive symptoms were not associated with requesting any types of assistance from 2-1-1 (Table 2).

3.4. Secondary analyses

To explore possible reasons for the strong and consistent association between mental health and transportation needs, we conducted a series of post-hoc analyses. We first used bivariate analyses to identify potential confounding variables, defined as being positively associated with both transportation requests to 2-1-1 and one or more mental health conditions assessed on the survey. We tested age, gender, ethnicity, income, education, having a personal doctor, insurance status, self-rated health, cigarettes smoked per day, rurality, employment and race as potential confounders. Being white, living in a rural area, and not being employed were associated with increased likelihood of transportation requests and increased likelihood of having at least one of the mental health conditions. We then tested multivariable logistic regression models that adjusted for the impact of the three potential confounders and controlled for reporting multiple mental health conditions. In adjusted models, PTSD, bipolar disorder, drug or alcohol use disorder, and ADHD remained significantly associated with requesting transportation assistance. (Supplement Table S1).

4. Discussion

In a low-income sample of helpline callers, prevalence of lifetime mental health conditions was quite high, exceeding rates in the general population (Kessler et al., 2012). Rates of mental health comorbidities were also much higher than in the general population (Kessler et al., 2005), with over half of the sample reporting a history of multiple mental health conditions.

We found strong and consistent associations between having a history of six different mental health conditions and requesting

transportation assistance. In unadjusted models, those reporting a past diagnosis of depression, anxiety, PTSD, bipolar disorder, drug or alcohol use disorder, or ADHD had over twice the odds of requesting help with transportation. Multiple mental health conditions were also associated with food assistance needs, and requests for food assistance were almost four times more common than transportation requests among 2-1-1 callers in our sample. The strongest associations were between PTSD, ADHD and personal safety. Participants reporting these conditions had over 3 and 4 times the odds of requesting personal safety assistance, respectively. However, less than one percent of the sample requested assistance with personal safety needs, and associations with mental health were not as consistent as with transportation needs.

Given the strong and consistent associations between mental health and transportation needs in this sample, we explored this relationship further in post hoc analyses and discuss possible reasons for this association and implications for mental health service providers and community agencies. To better understand the pattern of results with transportation needs, we tested whether other factors could account for some of the association. Transportation needs tend to be higher among certain population sub-groups, including seniors, those in poor health or disabled, and those living in areas with limited or no public transportation systems (e.g., rural settings) (Choi and DiNitto, 2016; Blais and El-Geneidy, 2014; Mattson, 2011). Studies in many of these populations find limited mobility increases isolation, social exclusion and unemployment (Adorno et al., 2018; Stanley et al., 2011; Gurley and Bruce, 2005), and is associated with reduced well-being and increased depression (Stanley et al., 2011; Vella-Brodrick and Stanley, 2013; Vallée et al., 2011). When we included potential confounders as control variables in regression models – transportation requests and mental health conditions were both higher among white participants, those living in rural areas, and those not employed outside the home – those reporting PTSD, bipolar disorder, drug or alcohol use disorder, or ADHD still had significantly greater odds of requesting transportation assistance.

When 2-1-1 helplines receive requests for transportation assistance, they provide referrals to community agencies providing these services. Transportation requests were fairly uncommon in our sample (4% of all requests), in part because 2-1-1 is not a transportation helpline. Other agencies focusing primarily on transportation services – for example, helping people with disabilities, senior citizens, or people in rural areas – receive far more requests for transportation. In Missouri, where this study took place, Metro Call-A-Ride provides 500,000 trips per year (Statistics and Information from Fiscal Year 2019, 2019) and OATS Transit provides over 1.5 million trips per year (OATS Transit, 2021). Furthermore, because 2-1-1 is a referral agency and not a service provider, once a caller receives a transportation referral, they may never need to go back to 2-1-1 to request transportation support, because they now have a direct source to contact in the future.

Several unique characteristics of the study sample may have influenced the pattern or magnitude of associations between social needs and mental health. First, all participants were actively seeking help for unmet social needs. Most social needs research is based on self-reported survey items. In contrast, needs described in this analysis were sufficiently urgent that the person actively sought help to address them. In Bradshaw's taxonomy, these are "expressed needs" (Bradshaw and McLachlan, 1972) and may be more severe than needs identified through screening alone (Verdecias et al., 2021). Second, all participants smoked cigarettes daily, a behavior associated with multiple mental health conditions and considered by many to constitute self-medication for mental health conditions (Drope et al., 2018). To determine the generalizability of our findings, future replication research should include more diverse community samples.

Lack of transportation may impact the independence and autonomy of those with mental health conditions, as well as their access to mental health treatments. A person's perceived independence and self-reliance are often connected to their ability to consistently access safe and reliable transportation (Musselwhite and Haddad, 2010). Being able to move freely for recreation, leisure, or work commitments contributes to a sense of individual autonomy (Ziegler and Schwanen, 2011). In addition, lack of transportation can be a primary factor driving no-show rates for mental health services and contributing to a person's inability to complete courses of mental health treatment (Behavioral Health Network of Greater St. Louis, 2018). Yet, most mental health public funding streams specifically name transportation as an unallowable cost.

The mental health service delivery system is simply not designed to adequately treat all individuals who are not able to show-up in person. So, for individuals seeking help with mental health conditions, getting there is more than half of the battle. This is starting to change with widespread adoption of telehealth services as a result of the COVID-19 pandemic (Haque, 2021), but it is too early to tell if the shift to virtual service delivery will last. Also, the digital divide threatens to make even this option a new barrier to individuals without adequate access to technology to take advantage of virtual services (Friis-Healy et al., 2021).

Prior research suggests social needs expressed to 2-1-1 could be potential markers for certain unexpressed social needs (Verdecias et al., 2021) or preventive health services (Alcaraz et al., 2012). These studies propose identifying markers could help implement smart systems that prioritize subgroups of 2-1-1 callers for proactive screening and referral for potential unexpressed needs. For example, based on findings from the current study, 2-1-1s and other service agencies, particularly those providing transportation services, might assess mental health needs and help connect those who need it to mental health services. Transportation agencies could also increase clients' exposure to information about mental health services by assuring brochures, posters or other resources are available in all vehicles, or train staff members to engage clients in non-threatening ways about mental health and provide referrals as needed.

It may also be beneficial for mental health service providers to prioritize screening and assistance for unmet social needs (Shim and Compton, 2018), including transportation. Currently, evidence is mixed as to whether transportation interventions implemented by the healthcare sector improve health (Solomon et al., 2020), and while transportation is one of the more commonly assessed social needs (Fraze et al., 2019) many widely used screening tools only assess it in the limited context of medical transportation (Social Interventions Research and Evaluation Network, 2019). In addition to screening for transportation needs, mental health service providers could potentially partner with local service agencies to strengthen community capacity to address the social needs of patients given referrals from the healthcare sector. More rigorous evaluation of transportation needs and interventions among people with

mental health conditions is necessary to determine their acceptability and effectiveness.

In addition to the unique sample characteristics mentioned previously, two other important limitations of this study must be considered. First, although data on social needs and mental health were collected a few days apart, it is essentially a cross-sectional study. It was not possible to determine the direction of causality between mental health and social needs. Longitudinal studies suggest causal pathways between unmet social needs and mental health conditions can be bi-directional (Huddleston-Casas et al., 2009) and mental health conditions such as depression can be caused by direct or indirect effects of unmet social needs (Shields-Zeeman et al., 2019). Second, most mental health conditions in the study are lifetime diagnoses, and we have no data on how long ago each diagnosis occurred, whether or how each was treated or how recently symptoms of conditions were experienced. Given the mean age of the sample (48.4 years), participants could have reported on a diagnosis or symptoms from decades prior. Nor do we know whether any current diagnoses are being managed effectively. All of these are important details to be explored in future research.

5. Conclusion

Reporting a history of mental health conditions was associated with greater likelihood of requesting help for unmet transportation needs in a sample of low-income smokers. This finding could inform practice for social service agencies, particularly those providing transportation services, and for mental health service providers whose clients face transportation barriers. Community-based agencies providing transportation or mental health services could form partnerships to provide linkages between services and increase capacity to address transportation and mental health needs of clients. Moreover, this information could contribute to the creation of an early warning system for mental health concerns, which currently does not exist. The mental health sector is designed to respond at the point of crisis. Better understanding the apparent link between transportation needs and mental health could inform future strategies for earlier intervention or improved management of mental health conditions. Further studies should seek to replicate these findings in broader samples and test whether transportation interventions implemented by social service agencies or mental health service providers have positive benefits for mental health.

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Author statement

Rachel Garg: Conceptualization, Formal Analysis, Writing – Original Draft and Editing **Serena N. Muhammad:** Conceptualization, Writing – Review and Editing **Leopoldo J. Cabassa:** Conceptualization, Writing – Review and Editing **Amy McQueen:** Funding acquisition, Writing – Review and Editing **Niko Verdecias:** Writing – Review and Editing **Regina Greer:** Writing – Review and Editing **Matthew W. Kreuter:** Conceptualization, Funding acquisition, Writing – Original Draft and Editing.

Declaration of competing interest

The authors report no financial conflicts of interest.

Data availability

Data will be made available on request.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jth.2022.101357.

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